1. $\frac{d}{dx}\sin x$ $\cos x$
2. $\frac{d}{dx}\tan x$ $\sec^2 x$
3. $\sin\frac{\pi}{6}$ $\frac{1}{2}$
4. $\frac{d}{dx}\sec x$ $\sec x\tan x$
5. $\cos\frac{\pi}{2}$ 0

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3.6b Chain Rule

Repeated use of the chain rule. Find the derivatives of:

$g(t)=\tan(5-\sin 2t)$ $\quad g'(t) = 2\cdot(-\cos(2t))\sec^2(5-\sin(2t))$

$u=2t$ der of inside

$v=5-\sin u$ der of middle

der of outside

$\cancel{f(x)=\sqrt[3]{1+\sin^2(3x)}}$

$h(x) = (\sin(x^3+2x)+\cos(5x))^4$ $\quad u^4 \quad 4u^3$

$h'(x)=\left[(3x^2+2)\cos(x^3+2x)-5\sin(5x)\right]4\left(\sin(x^3+2x)+\cos(5x)\right)^3$

$+5(-\sin(5x))$

$5-\sin(5x)$

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$y=\sec(\tan(x^3+x))$

$y'=(3x^2+1)\sec^2(x^3+x)\sec(\tan(x^3+x))\tan(\tan(x^3+x))$

$y=\sec x\tan(x^3+x)$

$y'=\sec x\left((3x^2+1)\sec^2(x^3+x)\right)+\tan(x^3+x)(\sec x\tan x)$

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Chain Rule for parametric equations

$\boxed{\frac{dy}{dx}=\frac{dy/dt}{dx/dt}}$

slope $=\frac{dy}{dx}$

Find the tangent to the hyperbola branch defined parametrically by

$x=\sec(t)\quad y=\tan(t)\quad -\frac{\pi}{2}<t<\frac{\pi}{2}$ at $t=\frac{\pi}{6}$

$x=\sec\frac{\pi}{6}=\frac{2}{\sqrt3}\quad y=\frac{\sqrt3}{3}$

$\frac{dy}{dt}=\sec^2 t$ $\quad \frac{dy}{dx}=\frac{\sec^2 t}{\sec t\tan t}\Big|_{t=\frac{\pi}{6}}$

$\frac{dx}{dt}=\sec t\tan t$ $\quad \sec\frac{\pi}{6}=\frac{1}{\cos\frac{\pi}{6}}=\frac{1}{\left(\frac{\sqrt3}{2}\right)}=\frac{2}{\sqrt3}$

$\frac{\left(\frac{2}{\sqrt3}\right)^{\cancel{2}}}{\cancel{\frac{2}{\sqrt3}}\cdot\frac{\sqrt3}{3}}\quad\frac{3}{\sqrt3}=\boxed{2}$ slope of tan line

$\tan\frac{\pi}{6}=\frac{\sqrt3}{3}$

$y=2\left(x-\frac{2}{\sqrt3}\right)+\frac{\sqrt3}{3}$

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Find the derivatives:

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Radians vs Degrees

$$x^{\circ} = \frac{\pi}{180} x \ radians$$

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